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the advice of our superiors that has induced us," said the clergymen; "it was not our will; it is St. Molaise of Damh-Inis that has sent us to speak to thee, for the following reason:—

"As a farmer of Damh-Inis had been attending to his cows at early morning, he saw four armed men, with their shields down, passing over the island. He immediately saw four other men meet them, whereupon they struck at each other, so that the sound of the stricken shields could be heard throughout the island, until they all fell at both sides, but one man only, who escaped, mortally wounded.

"The seven slain men were burned by Molaise, and they left behind them as much gold and silver as would be a load for two of us; the gold and silver ornaments of their cloaks, their necks, their shields, their spears, their swords, their hands, and their tunics. 'And we have come,' said they, 'to know how much of that gold and silver you will claim for your share.' 'Not so,' said King Diarmaid, 'what God has sent to Molaise, I shall not share with him. Let him cover his relics with it.' This was verified. It was with that silver and that gold, St. Molaise's relics were ornamented, namely, his shrine, and his minister, and his crozier."

The President remarked that the reliquary here called the "Minister" of St. Molaise, was most probably the box, a model of which was before the Academy. It contained a MS. of the Gospels which ecclesiastics of that period (the seventh century) were wont to carry with them in their missionary travels. These volumes often contained, together with the Gospels, the ritual for the visitation and communion of the sick, as in some MSS. of this class in the Library of Trinity College, Dublin; and a valuable "Minister," or ornamental box of this description, although of a much later date, now in the possession of the Earl of Ashburnham, contains an ancient MS. missal, to which the President had some time ago called the attention of the Academy.

The legend is curious, as showing that valuable ornaments of gold and silver were worn generally by warriors upon their persons at the period to which it refers, and also that there was at that time a sort of law of *treasure trove* in Ireland, by which the king was entitled to the gold or silver found under the circumstances related in the foregoing narrative.

ROBERT MALLET, C. E., F. R. S., read—

SOME REMARKS UPON CAPTAIN BLAKELY'S, R. A., PRETENSIONS TO PRIORITY AS ORIGINAL DISCOVERER OF THE PRINCIPLES, AND INVENTOR OF THE METHODS, OF CONSTRUCTING ORDNANCE IN SUPERIMPOSED RINGS, WITH INITIAL TENSION.

Two distinct issues have been raised by Captain Blakely, in reference to right of priority, by his paper, read on the 14th of May last, and entitled, "On the Practical Application of a Principle announced to the Academy

by R. Mallet, Esq." &c., and by his continuation, read on the 28th of May last,\* arising out of the discussion upon the former.

I regret that I was so engaged elsewhere since the meeting of 14th May, as to have been unable to supply, as I had intended, a written memorandum of what I said then in reply; and that I was unavoidably absent upon the last occasion, and therefore unable at the moment to reply to the statements by which, now for the third or fourth time since the year 1855, Captain Blakely has endeavoured to take from others rights of priority, as a discoverer and inventor, that I cannot admit ever belonged to him. I am now, however, enabled, by permission of the Academy, to place upon permanent record the facts by which those rights must be adjudged. I hope to do so in a clear and consecutive manner, and I challenge Captain Blakely to impugn the correctness of the statements I am about to make, in any way material to the issue.

The two issues raised are, first, Is Captain Blakely the true and original *inventor* of the *method* of constructing ordnance in superimposed rings, with initial tension,—the first man who had clearly grasped the *idea*, that by such construction a vast accession of strength might be given to the cylinder,—the first who comprehended its importance,—and the first who pointed out or invented the method by which the idea should practically be carried out or realized? This issue lies between Captain Blakely and myself, in the first instance.

The second issue lies between Captain Blakely and Dr. Hart, and arises on the question, Which of those two gentlemen first *investigated, in mathematical form, how much* additional strength this construction could give, *and what were the laws* that should regulate it?

The determination of both issues resolves itself into a question of dates.

It has been long recognised and understood all over Europe, as a principle, that *first publication establishes the right to priority in invention, investigation, or discovery*; hence the maxim of patent law, that "second inventors have no rights"—a maxim equally acted on throughout the world of science, as respects the rights of scientific investigators or discoverers, ever since the days of Newton and Leibnitz.

The dates, then, upon which Captain Blakely's claim to prior publication rests are as follow:—Upon the 27th of February, 1855, he applied for a patent for improvements in ordnance, lodging a provisional specification. This patent was specified on the 14th of August, 1855. Its claims, as specified, are for "the forming guns of an internal tube, enclosed in an external casing. The latter may be formed in rings, which may be driven on upon the internal tube, made conical to receive them; or may be heated and shrunk on. Two or more plies of such rings may be used; and old guns, i. e. guns cast on the then ordinary plan, may be strengthened by such rings." This specification (No. 431, for A. D. 1855, in Patent Records), therefore, contains the idea and invention of increasing the strength of guns by superimposed rings, with initial tension; although it is remarkable that no allusion whatever is made throughout to the

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\* [Mr. Mallet was not present on this occasion.—Ed.]

*principle* upon which such increase of strength depends. Provisional specifications, being merely part of the machinery of the Patent Office, remain buried in its archives for six months; the lodgment of the full specification is the date of first publication of any patented invention. Captain Blakely's publication of this invention, therefore, *through the intervention of his patent*, dates from the 14th of August, 1855. He can claim otherwise an earlier date, however. In 1855 he published a pamphlet, in which the method of construction is described, and in which, for the first time, his mathematical investigation of the law of increased strength, due to it, appears. The preface to the first edition of this pamphlet is dated the 27th of June, 1855; it must, therefore, have been first circulated at a later date, and, upon inquiring personally at the publisher's (Ridgeway, Piccadilly, London), I was informed that it was not issued before the end of July or beginning of August, 1855—in fact, not until within a few days before the date of the specification of his patent; and this is the earliest period at which, in any way whatsoever, he has *ever hitherto* attempted to show that he had published or communicated either the method of construction, with a knowledge of its principles, or the mathematical investigation of it. All Captain Blakely's other proceedings subsequent in date we may pass over as immaterial to the issue before us.

The 9-pounder—the achievements of which have been so often referred to—was not brought to Woolwich, nor fired, until very late in the year 1855 and early in 1856, and hence has nothing to do with the matter before us. A previous gun, an 18-pounder, of cast-iron, hooped with wrought-iron rings, which appears to have been the very earliest produced by Captain Blakely, was burst on trial at Woolwich on the 25th of May, 1855,—as stated in his own pamphlet, on “A proposed new method of constructing cannon,” &c., p. 28, published in 1858 by Ridgeway, London. If we take the production of this gun to be equivalent to the first publication of the method of construction by initial tension by Captain Blakely, then his claim dates from the 25th of May, 1855, to the *method of construction*, and, as already stated, from July or August, 1855, for the *mathematical investigation* of its laws.

Now as to the dates of my own proceedings. The general principles of the construction of built-up guns—the fact that an enormous accession of strength could be attained by external rings, with initial tension—were known to me from about the year 1850, and were first suggested to my mind by reading certain passages in Mr. Edwin Clarke's book on the Britannia Bridge, where (vol. i., p. 306, and note to p. 311) facts may be found containing the germ of the whole theory. I, however, gave no publicity to my notions until the year 1854. In October, 1854, I made my original design for the 36-inch mortars, since constructed by Government. That design, made and then dated by my own hand, lies now before the Academy, as exhibited by me here on the 14th of May last. (See p. 335.)

In December, 1854, that identical design was exhibited to the Ordnance authorities at Woolwich, and to many other persons; amongst others,



to Captain Boxer, Superintendent of the Laboratory Department, Woolwich, and to General Portlock, at that time Commandant of the Royal Military Academy. The design, as may be seen, shows the whole chase of the mortar, constructed in plies of two thicknesses of superimposed rings, arranged conically, so as to admit of producing the initial tension either by driving on, or by shrinking on hot, and the cast-iron chamber, hooped externally with wrought iron. This, then, is the date of my first publication of this method of construction—*seven months prior* to the earliest date assignable to Captain Blakely's first publication *in print*, and nearly *six months before he produced his first experimental gun*.

The 36-inch mortars were ordered by Government to be constructed early in April, 1855, and I had my designs and specifications for them in the contractor's hands, and the work in progress, on the 11th of June, 1855. Speed in their completion was at that time primary to all other considerations to bring them before Sebastopol and Sweaborg; and with that view, having found that contractors were ready to undertake to forge the chases in a single thickness, I abandoned the more tedious construction in superimposed rings. Within a short time, however, the bankruptcy of the contractor (Mare, of Blackwall), and the sudden peace with Russia, afforded an opportunity for going back to the original principle of construction, and so these two great mortars have been constructed in rings, superimposed with initial tension, as in principle in the first instance designed.

Early in May, 1855, I, for the first time, visited, in company with Professor Downing, and conversed on the subject of ordnance construction, with Dr. Hart. On that occasion I stated to him my views of the increase of strength that might be attained by external hoops, and illustrated to him my conviction that these would be more effective, as they were removed further from the axis, by reference to the hoop upon a common tub (as stated by me in discussion here on the 14th of May last, and on that occasion admitted by Dr. Hart, as still in his remembrance). My illustration was, that if you take off a hoop from a common tub, interpose a number of blocks between it and the exterior of the staves (or, what is the same thing, thicken the latter, the internal diameter remaining the same), and drive on the now lengthened hoop over the blocks with the same tightness, i. e., with the same strain per unit of section that it had before, then the tub will be able to bear a greater internal fluid pressure than before.

This involves the whole principle in question, and I am glad to find that the circumstance is still fresh in Dr. Hart's memory, as sufficiently proving that, previous to my very first interview with him, both the method and the importance of the method, of ringed structure with initial strain were generally known to me. Of that portion of our conversation to which Dr. Hart recurred here on the 14th of May last, namely, "that I referred him to a mechanical question, which I represented as an application of the principle of the lever to a cylinder, by surrounding it with a series of blocks, and fastening a hoop round these blocks," he has retained a less accurate recollection as to what took

place. I referred to the lever only, as one common-sense mode of illustrating the effect of the removal of the hoop further from the axis, on the assumption that the tub or gun burst by opening at one side only, and turning round the opposite one at the internal surface, both parallel to the axis. This, however, is at present immaterial.

At the date of this, my first visit to Dr. Hart, my designs for the 36-inch mortars, as actually contracted for, and substantially as finally carried out, had been completed. They were made throughout without either assistance or help of any sort from Dr. Hart or any one else, as I am sure he is ready to testify, so far as he is concerned. I leave the Academy to form its own opinion of Captain Blakely's renewed attempt, in his paper read here on the 28th of May last, to make it appear by an extract from Dr. Hart's letter in "The Mechanic's Magazine" (February 21, 1857, p. 176), and otherwise, that Dr. Hart was in fact the real designer of those mortars, and "that he, and not Mr. Mallet, was an original and independent inventor." This suggestion was first broached in December, 1857, through "The Press" London newspaper, and, though then formally refuted by me in that paper and in "The Mechanic's Magazine," has been again produced by Captain Blakely. I trust Dr. Hart is here to give this his own contradiction, once for all.

That for which I was, and have always acknowledged myself, indebted to Dr. Hart was his mathematical investigation of the precise amount of increase of strength producible by annular construction with initial tension, and of the law regulating the theoretically exact proportioning of the superimposed tensions. His investigation was communicated to me in a letter dated the 6th of July, 1855, and in one of explanatory detail a few days later, and is contained in the Note W to section 282 of my paper "On the Physical Conditions involved in the Construction of Artillery," read to this Academy on the 25th of June, 1855. The equation (4) for solid made guns, i.e., guns made on the old or common plan (given at section 274 of the *text* of my paper as Dr. Hart's), was communicated to me by him on the 17th of May, 1855. It was the only communication I had from Dr. Hart previous to the reading of my paper to this Academy; it has nothing to do with the matter before us; and I only allude to it as accounting for Dr. Hart's name thus appearing in the *text* of my paper read on the 25th of June, 1855; while his investigation, contained in the Note W, and referring to the question now before us, was not, as I have stated, communicated to me until the 6th of July, 1855. The notes to my paper were added as the text was passing through the press, and it is so stated in the preface to the separate issue of the paper, published without alteration from the Transactions of the Academy.

Dr. Hart's investigation enabled me to know the precise tension at which each ring should be shrunk on upon the 36-inch mortars then in progress, and gave exactitude to my previous general notions on ringed construction; but I saw that the method he proposed for regulating this, viz., by difference of temperature only, could not be practically car-

ried out. For this and other reasons dependent upon the molecular properties of iron, I did not employ his mode of regulating the tensions, but reverted to the method of boring out each successive ring as much too small to go over the preceding one when both were cold, as should give the tension required by his calculus, and heating them all *red hot*, before superimposing them, as proposed in the text of my paper, sections 289 to 293.

I mentioned this to Dr. Hart in a hasty conversation (some time in 1856, I believe), and he appears to have quite misapprehended me, and supposed that I had neglected all regard to the relative tensions of the superimposed rings, for in a letter of his, addressed to Captain Blakely, and published by the latter, Appendix E of his pamphlet on Constructing Cannon, of 1858 (Ridgeway, London), already referred to, Dr. Hart does the unintentional injustice to say of me—"This caution," namely, the proportioning the tensions of the successive rings to calculation, "Mr. Mallet has, I believe, utterly neglected." In this same letter, in a previous paragraph, Dr. Hart, by a looseness of expression, I am sure equally unintentional, has also given ground for misapprehension; he says—"The construction which I proposed to Mr. Mallet when he was about to make his large mortars, and which, I am sorry to see, he did not fully adopt, was," &c. Now, Dr. Hart never proposed anything to me on the subject until long after those mortars had been designed, had far progressed towards completion, and after everything relating to their construction had been already settled by myself.

Dr. Hart's communication enabled me to determine the exact strain that each successive ring should have when in place, but did not even modify the practical method of obtaining such proportioned strains, which I had anteriorly devised, and adopted, much less suggest or determine anything relative to their constructive detail.

Dr. Hart has informed me that this letter was addressed as an ordinary private reply to a note from Captain Blakely, and that he gave him no authority to publish it.

My paper "On the Principles involved in the Construction of Artillery" was read to the Academy on the 25th June, 1855, leave of Council having been had for its reading on the 18th of that month. Its publication, therefore, dates from that time. Everything contained in the text which refers to the question before us, except words of reference in two or three places to Dr. Hart's investigation in Note W added in the printing, was in manuscript at the time, and laid upon the table of this Academy; and this was substantially the case with regard to every part of the paper, except the notes. Captain Blakely, however, in attempting to make out a later date for it, states in his second communication, read here on the 28th May last, that "some parts of Mr. Mallet's paper of 25th June, '55, must have been written in September, '55, at the earliest, for at p. 232 reference is made to a proposal to shrink hoops upon 13-inch mortars at Woolwich—which proposal, he says, was made by Colonel Wilmot on the 25th of September, '55." Now, the numbering of the page to which he refers proves that it was a copy



of the separate edition, and not of our Transactions, from which he quoted, and the passage referred to is *not in the text at all, but in one of the notes* to the paper, which I specially mention in the Preface to that separate issue—all take date after the reading of the paper, and were added as it was being printed, viz., in April and May, 1856. Yet he proceeds to say—"In consequence of the error in the date ascribed to Mr. Mallet's publication, I retract my former admission, that he was the first to publish the theory," &c. I leave the Academy to form its own judgment as to the value of a conclusion *based on such grounds*.

Again, in Captain Blakely's paper, read here the 14th May last, he says—"I wrote to Dr. Hart to know the date of his researches, and his reply was, that he had not turned his attention to the matter until some months after he (Blakely) had made the guns,"—namely, the 18-pounder and the 9-pounder burst at Woolwich in 1855-56. Now, the issue between Dr. Hart and Captain Blakely is simply which of them first published the mathematical investigation, and has nothing to do with the date at which Captain Blakely made his guns. The date of these guns would be an argument in point as against me, as proving a prior general knowledge of a *method of construction*, if it could be shown that they were made anterior to the date, December, 1854, at which, as I have already shown, I exhibited designs for ordnance involving the same method of construction; but it does not touch the question as between Dr. Hart and Captain Blakely; and is made to appear to bear upon it only by wilfully confounding the two issues of this controversy.

I am astonished at, but cannot comprehend, his adding to this reasoning, that "Mr. Mallet corroborated what he said." I deny the fact.

In this same paper, Captain Blakely says—"He received definite information three years ago" from both Dr. Hart and myself (as to those rights of priority, namely), and that "if he entertained mistaken notions, he was misled by myself."

I never saw Captain Blakely, nor knew anything about him beyond a note of introduction which he sent me, until October, 1857, the same month in which the 36-inch mortars were first fired. On the morning of the day on which those mortars were first fired at Woolwich (October 19, 1857), I received the following note from Captain Blakely (not dated, but its last words fix the date):—

"10, Bolton-street, Piccadilly [Oct.\*], Monday.

"MY DEAR MR. MALLET,—I enclose you a number of 'The Mechanics' Magazine,' criticizing my pamphlet on guns, and saying you have forestalled me. A disclaimer of this would come much more gracefully from you than from me, and I could add, that only in that one point

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\* Erased in Captain Blakely's original MS.

had I forestalled you, which cannot in any way lessen the merit of your proposals, and I hope I may say, *accomplishments*. As you will see by the cover that I printed only for private circulation. My patent is dated February, 1855. I wish you would buy a share, and let me get abroad. I will call on you before eleven [o'clock next day, namely], as any letter to the Magazine must be written by Tuesday, and it would not do to wait for your success before writing. I long to hear about to-day's firing.

“Yours very truly,  
“T. A. BLAKELY.”

The next day after, I accordingly received a visit from him at my office in London, when he produced a copy of his earliest pamphlet of July or August, 1855; observed that those mortars were constructed on the principles he had therein developed, and which he had patented; claimed priority, and, in fact, gave me to understand that he would deal very leniently with me as a patentee, and “make it square,” if I would share with him the credit of constructing those huge pieces of ordnance. To this I, on the instant, replied by turning up a copy of the separate issue of my paper read to this Academy, and pointing out to him that, even upon the face of the two printed documents, my own priority was obvious, by the dates in each, and I declined to connect myself or my projects in any way with him, or to admit his priority.

Finally, I offered, on my immediate return to Ireland, to give him all other dates that might be material to the question.

A few days after, I received the following note from him:—

“Oct. 25.

“MY DEAR MR. MALLET,—I regret that you have decided to under-rate that part of your method of manufacturing cannon, which seems to me to be its chief feature, and which I am personally anxious to have duly appreciated, as I myself proposed to Government a similar plan about the same time as yourself. I really think it would be more *judicious* for both of us to concede to each other a fair share of the credit of the invention—to put the affair even on that footing—for if you run down what most will think the *only new* feature, but little will remain.

“However, I put it to you in another shape, viz., that I request you will not underrate the importance of ‘forming the guns of concentric laminæ, of which the outer have an initial tension,’ as I particularly wish it to be recognised for my own sake, I feel sure you will gratify me in this.

“Believe me, yours truly,  
“T. A. BLAKELY.”

How far these are the letters of a man who felt strong in the consciousness of his own right of priority, I leave the Academy to judge. I gave them no reply, and, without waiting for the dates I had offered him, or making any prior communication to me, he published a letter in the next

month's "*Mechanic's Magazine*" (November, 1857), in which he states that *I had informed him that I could not say which of us had the right of priority* in the proposition to construct built-up guns, and of the principles upon which they depend. His own notes above will prove whether I left the matter in doubt.

That statement I forthwith replied to, and corrected, by a letter published in "*The Mechanic's Magazine*," 12th December, 1857, in which I have given the principal dates, and other circumstances, upon which this question rests; and that letter ought to have settled the controversy. I found myself compelled, however, in the very same month to go over the same ground in the pages of "*The Press*" London newspaper.

There has been, therefore, no misleading on my part. I have from the outset denied Captain Blakely's pretensions, and now thrice justified my denial by simple appeal to dates.

I shall not waste the time of the Academy by following Captain Blakely through the confusion that he has created by his second paper here of 28th of May last, all resting upon the supposition that Dr. Hart's calculations were made and communicated to me in 1854, in place of July, 1855. The mistake as to this date is Captain Blakely's own.\* I never made any such statement here on the evening of the 14th of May last. I could not have done so, for I read out the dates from the paper (a list of dates referring to this subject) which I now hold in my hand; and in any case I am ready to produce Dr. Hart's original notes to me, the first dated 6th July, 1855, at any time; and thus Captain Blakely's conclusion "that Dr. Hart's memory is more accurate than mine, and that he, not Mr. Mallet, was an original and independent inventor," resolves itself simply into a blunder of his own in adopting 1854 for 1855.

Fortunately, I have never trusted to memory; I have sustained all that I have here or elsewhere brought forward by appeal to documents or credible witnesses, and I can only regret, for the sake of his own scientific rights, that Dr. Hart did not apply to me, for the sight again of his own notes, and so have got their exact dates, before hereplied from memory to any of Captain Blakely's questions on this subject, and so prevented much of the confusion in which his own right to priority in publication of the mathematical investigation has been involved by that gentleman.

And now to recapitulate. The result of the evidence I have adduced upon the two issues before the Academy is:—Upon the first, between Captain Blakely and myself, as respects priority in the *invention of the method* of constructing ordnance in superimposed rings with initial tension, and *clear grasp of the idea* of increased strength so obtained. I exhibited the design for ordnance constructed on this method in December, 1854. I published to this Academy a full exposition of the method and of its principles on the 25th of June, 1855. Captain Blakely's earliest evidence of either his *knowledge or use* of the method is that of his gun, burst at Woolwich on the 25th of May, 1855; and his first *exposition of*

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\* Or Dr. Hart's, if the latter uttered the date as 1854, and not 1855, on the 14th May.

*the principles* of the method by his pamphlet of 1855 was not before the public earlier than the end of July, 1855 (though dated in his Preface 27th of June, 1855), nearly a month after my paper had been read to this Academy.

His earliest evidence of having made public either his knowledge or use of the method, therefore, takes date between five and six months posterior to mine, and the right of priority rests with me.

Upon the second issue, between Captain Blakely and Dr. Hart, as respects priority in *mathematical investigation* of the strength of ordnance made according to this method and the law of tensions of the rings; Dr. Hart published his investigation by communicating it to me (and I to others), on the 6th of July, 1855. Captain Blakely published his investigation in his earliest pamphlet, which was not issued before the end of July or the beginning of August, as stated to me by his own publisher.

Dr. Hart's publication, therefore, takes the earlier date by about a month, and the right of priority remains with him.

These verdicts are substantially in agreement with a formal report of the Ordnance Select Committee, made by direction of the Minister of War, at Captain Blakely's own desire, dated 15th of January, 1858, and drawn up by Colonel Eardly Wilmot, R. A., an officer whose scientific abilities are known to some of this Academy, and to whose gentlemanly impartiality I can myself bear witness. That Report decides that, whoever was the first inventor of the method of ringed construction, Captain Blakely was not.

After this marshalling of facts and dates, the Academy will receive, for what it is worth, Captain Blakely's assurance to them in his paper of the 14th of May last, that "he had taken such precautions to keep his proceedings secret, that it is utterly impossible Mr. Mallet could have learnt anything from him"—rather so truly—inasmuch as, without any secrecy in question, my learning was at least five months in advance of his own.

As respects myself, I will only venture to say this: that, in the text of the paper on the Construction of Artillery, read by me to this Academy in 1855, I believe the clearest and most complete enunciation of the general principles and methods of construction of built-up guns, published up to this day, are to be found. I have been assured by the renowned artillerist, Colonel Cavalli, of the Sardinian Army, and by officers of the army of the United States, that that paper is looked upon in Europe and in America as the foundation from which much of the improvement of ordnance since the date of its publication has originated. Its views, antecedent in time, are the same as those upon which the much-talked-of Armstrong guns, are constructed. For this we may take Captain Blakely's own words, who, in the celebrated gun discussion of this year at the Institution of Civil Engineers, London, is reported (*Minute of Proceedings*, Ins. C. E., Sess. 1859-60, p. 60) to have said:—"The barrel of the Armstrong gun was an example of the mode of construction recommended by Mr. Mallet. Any person following the

instructions contained in his 'Treatise on Artillery' (Trans. R. I. A.) could scarcely fail to make a barrel like that of the Armstrong gun." I will add that the peculiarities in the mounting or equipment of those guns for field service, by which the recoil is absorbed by elastic resistance, in place of dead weight in the gun, &c., are clearly described in Note T, and elsewhere in that paper.

The Academy will, therefore, recognise that the rights of priority in principles and methods, the applications of which are now changing the artillery and armaments of the world, offer a temptation to plagiarism proportionate to the magnitude of the results arising from them; and they will, I trust, excuse the length at which, in consequence of Captain Blakely's first paper, read here 14th May (which, without once asserting boldly his own priority, left it to be inferred hereafter, and assumed it tacitly throughout), I have been compelled to assert the principle of "*suum cuique*."

While I assert my own rights in this matter, however, I will not follow Captain Blakeley in ignoring those of others. As respects himself, I have always admitted that I believed him an independent second inventor and discoverer, and that he deserved whatever merit or rights such can carry. He has, however, studiously and at all times avoided reference to the claims of M. Thiéry, to whom I believe justly belongs the merit of having been the first person in point of date who proposed the ringed structure with initial tension, and pointed out its advantages in increasing the strength of artillery, in words that show that he possessed a general notion of the principles upon which such increment of strength depends. In his work, entitled, "*Applications du fer aux Constructions de l'Artillerie*, par A. Thiéry, Capitaine d'Artillerie," published at Paris, by D'Anselin, 4to, in 1834, he has in chap. ix. p. 153, *et seq.*, headed "*Canons en fonte avec enveloppe en fer forgé*," distinctly described and figured in a large lithographed plate, the application of external rings of wrought-iron shrunk on hot upon a cast-iron tube, to form a built-up gun.

Any one who reads his pages, 155 and 156, of this chapter (in which he discusses the causes of the failure of certain guns, which it appears had been already tried in France, formed of a cast-iron barrel, round which the bronze envelope was cast in a fluid state, and traces it to the fact that the cast-iron, thus becoming heated and expanded in the casting, was left (when the gun was completed and cold) without any initial tension upon it, will see that Thiéry clearly recognised this principle, and he puts it beyond doubt in the following passage:—

*"Le moyen qui s'offre naturellement première, pour fretter un canon de fonte, en fer forgé, serait de le recouvrir d'une série de cercles superposés a chaud; les uns a coté des autres, et qui adhèreraient ainsi a cette bouche a feu de toute la force du retraits; force qui peut devenir excessive en portant a un tres haut degré la temperature du cercle en fer forgé"* (p. 156). In fact, as respects the method and knowledge of the principle of ringed construction, Thiéry's publication of 1834 embraces

everything that Captain Blakely's specification of his patent of August, 1855, does, even to the general similarity of the lithographs accompanying each respectively, and to the preference of a cast-iron interior instead of one of wrought-iron, upon which Captain Blakely lays so much stress, though erroneously, as Whitworth, Armstrong, and every other practical engineer have proved.

There have been three epochs in the use and knowledge of ringed structure in artillery: the earliest, which goes back to the "bombards" and "serpentes" of the early part of the fifteenth century, was that of the *use* of external rings shrunk on with initial tension, but *without any knowledge* whatever of the theory, or of the value of their being in initial tension, and the staves or tube that they enveloped being in compression, the construction being one of manipulative necessity only, and not of choice.

Thiéry (though not fully or completely) inaugurated the second epoch by showing publicly that, although the manipulative necessity was long past, it would be advantageous to return to the method, because of the principle of increased strength that it contained.

The third and last epoch was that in which I myself placed for the first time in a clear, descriptive light the general conditions and methodic principles of ringed construction, and in which Dr. Hart investigated and developed mathematically the laws by which such conditions and methodic principles are governed; both of these tasks were also more or less completely performed independently by Captain Blakely; but, as I have proved in this paper, at periods posterior to myself and to Dr. Hart, respectively.

CAPTAIN BLAKELY made some remarks in reply (June 14, 1860), of which he has since supplied the following memorandum:—

Mr. President,—If I rightly understand Mr. Mallet, he this evening bases his claim to priority over me, firstly, on his having laid a plan for constructing mortars before Government in December, 1854; and, secondly, on his having published the theory in a paper read to this Academy in June, 1855. He withdraws his statement, made here on the 14th ultimo, that he had a letter from Dr. Hart, discussing the whole question, and dated July, 1854, and tells us he meant to say, and believes he did say, 1855, not 1854.

Now, Sir, I made proposals on the subject to Government in September, 1854, and was so thoroughly convinced of the correctness of my views, and of the possibility of constructing very powerful cannon on the plan, that I went out immediately afterwards to Constantinople and Balaclava, and communicated with the Ambassador, the Commander-in-Chief of the fleet, and the officer commanding the artillery; and had guns been then strengthened on the plan I suggested, I feel confident many thousands of lives would have been saved, and the siege of Sevastopol much shortened.

So much for priority of suggestions to the authorities.

With respect to publication, the question is more intricate. We must first determine what is publication—telling thirty or forty persons of a discovery, or printing a description of it for the public.

Mr. Mallet claims to have informed this Academy of the matter on the 25th of June, 1855. Whether he did so or not, I will discuss presently. But, Sir, he acknowledges that one of my guns burst in May, 1855. Surely, before bursting, it must have been made; and before being made, its construction must have been explained to many! Such was the case. Not only did the manufacturers know of it, but they consulted some eminent men\* on the practicability of my plan; and, acting on their advice, offered, early in 1855, to contract to supply the Government with 16-inch mortars, made in three layers of consecutive tubes. Mr. Mallet's paper was printed for the public in June, 1856; but what I printed the year before, for private circulation, was advertised for public sale immediately on the cessation of the war with Russia.

On the question of priority of putting our theory into practice, Mr. Mallet has told us that his mortars were commenced after June, 1855, and that afterwards they were completed, on a different design, in 1857. I made five guns before he commenced his first.

Having now proved that I forestalled Mr. Mallet, in suggestions to Government, in communicating my views to a number of persons, in printing them for public information, and in putting them into practice, I cannot be suspected of any personal motive in stating, as I did at our last meeting, and as I do again now, that I believe Mr. Mallet is not an independent discoverer of the principle of construction in question, but that he learned it from Dr. Hart.

All who heard Dr. Hart's lucid explanation of the matter on the 14th ultimo, must have been convinced that his memory on the point is accurate. Mr. Mallet, he told us, came to him for advice about a plan for constructing mortars of very thick longitudinal voussoirs, fitted together like the staves of a tub, and surrounded by a single ply of wrought-iron rings, greater strength than usual to be obtained by increasing the thickness of the voussoirs, thus removing the wrought-iron rings from the centre, and obtaining the advantage of leverage. Dr. Hart saw clearly how heavy such a mortar would be, *and himself suggested the plan now universally used.*

Mr. Mallet has read to us one letter, in which Dr. Hart gave the same account. I will, with your permission, read an extract from another. It is from Dr. Hart to the Editor of "The Mechanic's Magazine," and published in No. 1760 of that periodical (February 21, 1857):—"My proposal, on which Mr. Mallet has acted," are the words here used by Dr. Hart in speaking of the plan in question; and I implicitly believe that

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\* Amongst others, Sir Charles Fox was consulted. He had made the discovery quite independently, and his advice was of great value. For him, therefore, I must persist in claiming priority of discovery over Dr. Hart and Mr. Mallet, as I did at our last meeting.

the proposal was Dr. Hart's, or he would not three times have said so. It clearly, then, could not have formed part of the paper actually read here on June 25, 1855,\* as Dr. Hart only communicated the details to Mr. Mallet in July; and it is equally clear that Mr. Mallet's first suggestion to Government must have differed from that ultimately acted on.

With respect to M. Thiéry's plans, I will only quote some words I find at page 152 of Mr. Mallet's work on Artillery,—words written when Mr. Mallet was probably more cool than he is this evening :—

“Solid reinforce rings have been repeatedly proposed and frequently applied to various projects and forms of cannon, but the author believes that the peculiar advantages of their application in thin concentric lamina, the internal ones of which shall be compressed by an *initial extension* of the external ones, *have never before been distinctly pointed out*, and their adoption proposed and urged; the essential and radical distinction being this, that by no arrangement or variation of design can a gun be formed of a single ply of rings, whose strength to sustain an internal pressure shall be greater than the cohesive power of the material per square inch of section; whereas by the subdivision of the rings into a number of superimposed plies, *each compressing those within it*, the strength of the gun may be increased so as to bear an internal pressure any required number of times greater than the ultimate cohesive powers of the material, in fact, may be increased *ad infinitum*.”

I cannot believe, Sir, that this “essential and radical distinction” has disappeared since 1855. Indeed, M. Thiéry tried to make guns in the way he thought best, and failed utterly.

I will not follow Mr. Mallet on irrelevant questions. I regret much that I am obliged to take up your time at all in discussing what can be of so little interest.

The following donations of antiquities were presented to the Academy :—

By the Rev. W. Reeves, for the Rev. John Hamilton, a curious candlestick, found in a crannoge near Manorhamilton.

By the President, for Mr. Parke, of Dunally, a large cinerary urn, highly ornamented, found, with two others, near Ballymote, county of Sligo, in the year 1827.

MONDAY, JUNE 25, 1860.

JAMES HENTHORN TODD, D.D., President, in the Chair.

The PRESIDENT announced that the Academy was called upon that evening to elect a member of the Council, in consequence of the resignation of Mr. Haliday on the Committee of Antiquities. Ordinarily he

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\* This view is corroborated by what Mr. Jellett says, viz., that Mr. Mallet's original paper was not more than one-fifth part of the size of his published one.